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(54) Title: INFUSION PACKAGE MATERIAL

(57) Abstract: Infusion Package MaterialAn infusion package material with improved translucency. The material has a first web layer of parallel or randomised bicomponent thermoplastic fibres that is through air bonded to a second web layer of parallel or randomised bicomponent thermoplastic fibres.

INFUSION PACKAGE MATERIAL

The present invention relates to a non-woven material that is suitable for use as a material for making infusion packages such as tea and coffee bags. The material is substantially translucent. A method for making such a material is also described.

Background and prior art

The great majority of today's tea bags, and infusion bags generally, are manufactured from paper. The bags are substantially opaque so consumers can sometimes see the bags contain dark coloured particles but they cannot visually examine the quality of the tea in the same way as they could if the tea were loose. Many consumers therefore suspect the tea used in tea bags is somehow inferior to loose tea. Since tea bags are designed to provide a convenient means to prepare tea they often contain black tea that has been passed through CTC (cut-tear-curl) machines to give a fine particle size that infuses quickly. Some consumers perceive these fine particles as inferior to larger leaf tea. Indeed some cynical consumers even believe tea bags contain the sweepings from the tea factory floor.

The poor translucency of tea bag paper can therefore be a significant technical problem. It becomes particularly acute when packaging larger leaf teas since consumers cannot appreciate the size, shape and colour variations of these teas that they associate with high quality tea if they cannot see the tea within the bag.

The current structure and chemical composition of conventional tea bag paper simply does not permit sufficient translucency. Alternative materials are required.

A known alternative to conventional tea bag paper that provides a measure of translucency is a nylon or polyester mesh. This is a woven material but it is not heat sealable. It can be ultrasonically sealed but this requires specialised equipment that is not suitable for high-speed manufacture. The material is also generally too expensive for mass tea bag production.

In recent years manufacturers have developed alternative multi-layered non-woven tea infusion materials. For example:

United States patent specification US 5,527,429 (Papeteries de Cascadec) discloses a method for making non-woven tea bag paper with a repetitive texture of pattern. The method involves making a non-woven paper comprising a synthetic fibre layer and a cellulose fibre layer using conventional machinery then subjecting the paper to a calendering operation between a support structure and a heated cylinder having projections.

United States patent specification US 5,601,716 (Papier and Cellulose Technolologie-und Handels-GmbH) describes a low sift tea bag material made from at least two layers of non-woven substrate material. One layer is composed of natural fibres and is made by a conventional paper-making machine. The other layer is composed of synthetic fibres. The respective fibres are fused which closes a large number of pores in the natural fibre layer.

International patent application WO 98/50611 (Cargill Inc) discloses a fibrous material that contains a plurality of polylactide (polyester) fibres selected for their shrinkage properties. The material can be used for a wide range of purposes including tea bag paper.

European patent specification EP 145,499 B (Ethyl Corporation) discloses a tea bag constructed from a co-extruded multi-layer perforated thermoplastic film having a heat resistant outer layer of film forming resin and an inner layer of a somewhat less heat resistant film forming resin.

None of these specifications however addresses the problem of improving the translucency of infusion package materials. The present inventors, however, have found that that the problem can be solved by through air bonding two layers of bicomponent thermoplastic fibres.

Statement of the invention

In broad terms the present invention relates to a non-woven infusion package material with improved translucency comprising a first web layer of parallel or randomised bicomponent thermoplastic fibres that is through air bonded to a second web layer of parallel or randomised bicomponent thermoplastic fibres, said material having a translucency of at least 30 percent, preferably at least 40 percent, more preferably at least 50%.

Preferably at least 50% of the thermoplastic fibres of the second web layer are thicker than those of the first web layer as this provides the resilience to the final web.

Preferably the thermoplastic fibres of the first and second web layers comprise bicomponent polyester or a polylactide based polymer.

Preferably the thermoplastic fibres comprise an inner core of homo-polymer polyester or polylactide based polymer encased in an outer sheath of co-polymer polyester or a polylactide based polymer.

The first web layer preferably has a linear density of between 1.1 and 3.3 decitex, especially about 2.2 decitex. The second web layer preferably has a linear density of between 10 and 20 decitex, especially about 15 decitex.

The present invention also relates to a method for manufacturing a non-woven infusion package material with improved translucency comprising through air bonding a first web layer of parallel or randomised bicomponent thermoplastic fibres to a second web layer of parallel or randomised bicomponent thermoplastic fibres and compressing them to thickness between 0.01 and 0.1 mm.

"Translucent" is intended to mean sufficiently translucent for the unaided eye to ascertain the shape and colour of a particulate infusible material such as tea through. It can be measured in terms of the percentage of light that passes through the material using a photospectrometer.

"Polylactide based polymer" is intended to refer to polymers of polylactic acid or polylactide.

For the avoidance of doubt the word "comprising" is intended to mean including but not necessarily "consisting of" or "composed of". In other words the listed steps or options need not be exhaustive.

Except in the examples, or where otherwise explicitly indicated, all numbers in this description indicating amounts or concentrations of material ought to be understood as modified by the word "about".

Detailed description of the invention

The present invention concerns a non-woven material suitable for making infusion packages that is substantially translucent. The material has been designed for use in making tea bags and for convenience from herein the invention will be described with reference to tea and tea bags, however it should be clear that the material could be used to package other infusible substances such as coffee, cocoa and herbal preparations and the bags can be of any desirable shape and form including square, round, tetrahedral and spherical.

The infusion package material of the present invention comprises a first web layer of parallel or randomised bicomponent thermoplastic fibres that is through air bonded to a second web layer of parallel or randomised bicomponent thermoplastic fibres. The thermoplastic fibres are selected and combined in proportions that impart the material with the properties that make the material suitable for use as an infusion package material such as web density or grammage, wet and dry tensile strength, crease retention, seal and sift as well translucency. The material is sealable to form infusion packages, for example by heat or ultrasonic sealing methods.

The thermoplastic fibres of the first web layer are preferably randomised to improve the tensile strength in the cross direction in both wet and dry conditions. The fibres preferably comprise bicomponent polyester or polylactide. In some preferred embodiments the thermoplastic fibres comprise an inner core of homo-polymer polyester or polylactide encased in an outer sheath of co-polymer polyester or polylactide. The melting point of the inner core should ideally be greater than that of the outer sheath so that the fibres will readily bind with other fibres when the material is heat or ultrasonically sealed during tea bag manufacture but still retain a suitable integrity.

The fibres in the first web layer have a linear density of between 1.1 and 3.3 decitex, but preferably about 2.2 decitex. Decitex is well known in the art as a unit for defining the thickness of yarn or fibre; specifically the mass in grams of 10000 metres of the yarn of fibre.

The thermoplastic fibres of the second web layer are preferably randomised to improve the tensile strength in the cross direction in both wet and dry conditions. The fibres preferably comprise bicomponent polyester or a polylactide. In some preferred embodiments the thermoplastic fibres comprise an inner core of homo-polymer polyester or a polylactide based polymer encased in an outer sheath of co-polymer polyester or a polylactide based polymer. As before, the melting point of the inner core should ideally be greater than that of the outer sheath.

The fibres in the second web layer have a linear density of between 10 and 20 decitex, but preferably about 15 decitex. In some preferred embodiments up to 50% of the fibres of the second web layer have a denier of between 1.1 and 3.3, preferably 2.2, and the remainder have a denier of between 10 and 20, preferably 15. This allows the material to combine sufficient levels of transparency with sufficient levels of resilience.

The fibres are formed into a web by a carding process. The carding action, which takes place within the web former, involves combing the fibres between two surfaces clothed with flexible or metallic wires that have opposing wire points. This action occurs when there is a difference in the speed of the opposing surfaces. It helps to disentangle the fibres before transferring them to another roll in the web former.

After carding the fluffy light-weight web can be transferred to a randomiser in order to increase the randomisation of the fibres. This is important, as the interaction of the parallelised and randomised fibres is necessary to increase the cross directional

web strength. It also effects other properties of the material such as crease retention, infusion and sift.

The first and second web layers are thermally bonded together using a through air bonding method. The sheath of the fibres act as thermal binders, thus eliminating the use of other types of binders, such as latex or resin. The thermal bonding method can be varied to meet the requirements of the desired non-woven fabric or tea bag paper. The inventors have found that other techniques for bonding web or fabric layers such as wetlaid and drylaid combined with chemical bonding are not suitable.

The infusion package material of the present invention is substantially translucent so that consumers can examine the appearance of the tea contained in the bags made from the material. Translucency can be measured in terms of the percentage of light passes through the material as determined by a photospectrometer. The non-woven infusion package material of the present invention is at least 30% translucent. It is preferably at least 40% translucent and more preferably at least 50% translucent.

The material can only be used for making tea bags if it has sufficient tensile strength to withstand the stresses placed on it during tea bag manufacture (dry strength) and during use (wet strength). The dry strength of the material depends on the number of contact points between the fibres and the strength of the bonding between the fibres at these contact points. The mechanical strength of paper can be assessed by tensile testing using art known methods. The wet strength of the material depends to a large extent on the dry strength of the material. Most tea bags are brewed in freshly boiled water for several minutes so the bags must be able to withstand those conditions. Conventional tea bag papers contain binders so their hot water solubility can be a real issue. However the material of the present invention has no such binders. Some tea bags are intended to be brewed in cold or

iced water. In any event, the wet strength of paper under the appropriate conditions can be assessed by tensile testing, again using art known methods.

The wet and dry tensile strength of the infusion package material of the present invention is preferably between 5 and 15 N/15 mm in the machine direction and preferably between 2 and 5 N/15 mm in the cross direction.

Tea manufacture invariably produces some very small tea particles known as tea dust that tends to pass through tea bags when they are vibrated during packaging and transportation. Some of this tea dust is produced by the abrasion of the tea leaves in the bag. Consumers do not want to be greeted by this tea dust when they open a fresh carton of tea bags. It can be unsightly and suggests to some that the tea is poor quality. It is therefore important to minimise the sifting of tea dust through infusion package material.

Tea sift can be minimised by reducing the number and size of holes present within the body of the material. The choice and relative proportions of the fibres used to manufacture the material of the present invention can be important in achieving this.

Most tea bags are made from papers having a thermoplastic layer above a cellulosic base layer so that portions of the paper can be sealed together by the localised application of heat. The use of heat-sealable tea bag paper is highly desirable for many high-speed tea bag machines. When the infusion package material of the present invention is intended to be heat sealable it should preferably comprise at least 30% bicomponent thermally sealable fibres so that the material will be heat sealable and will resist to thermal damage.

CLAIMS

1. A non-woven infusion package material with improved translucency comprising a first web layer of parallel or randomised bicomponent thermoplastic fibres that is through air bonded to a second web layer of parallel or randomised bicomponent thermoplastic fibres, said material having a translucency of at least 30 percent.

2. An infusion package material according to claim 1 wherein at least 50% of the thermoplastic fibres of the second web layer are thicker than those of the first web layer.

3. An infusion package material according to claim 1 or 2 wherein the thermoplastic fibres of the first and second web layers comprise bicomponent fibres preferably polyester or a polylactide.

4. An infusion package material according to any preceding claim wherein the thermoplastic fibres comprise an inner core of homo-polymer polyester or polylactide encased in an outer sheath of co-polymer polyester or a polylactide based polymer.

5. An infusion package material according to any preceding claim wherein the first web layer consists of fibres with a linear density of between 1.1 and 3.3 decitex.

6. An infusion package material according to any preceding claim wherein the second web layer consists partially of fibres with a linear density of between 10 and 20 decitex.

7. An infusion package material according to any preceding claim wherein up to 50% of the fibres of the second web layer have a linear density of between 1.1 and 3.3 decitex, and the remainder have a denier of between 10 and 20

decitex.

8. An infusion package material according to any preceding claim wherein the wet and dry tensile strength in the machine direction is between 5 and 15 N/15 mm.

9. An infusion package material according to any preceding claim wherein the wet and dry tensile strength in the cross direction is between 2 and 5 N/15 mm.

10. An infusion package made from the infusion package material claimed in any one of claims 1 to 9.

11. A method for manufacturing a non-woven infusion package material with improved translucency comprising through air bonding a first web layer of parallel or randomised bicomponent thermoplastic fibres to a second web layer of randomised or parallel bicomponent thermoplastic fibres and compressing them to thickness between 0.01 and 0.1 mm.

INTERNATIONAL SEARCH REPORT

International Application No
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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 D04H13/00 D04H1/70 B65D81/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 D04H B65D D01F B32B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 883 707 A (NEWKIRK DAVID D) 28 November 1989 (1989-11-28) claims; examples	1-11
P,A	WO 01 88266 A (WARDLE GLYNN ARTHUR ;J R CROMPTON LTD (GB); ROSE JOHN EDWARD (GB);) 22 November 2001 (2001-11-22) page 2, paragraph 4 page 6, paragraph 4; examples	1-11
A	WO 98 50611 A (CARGILL INC) 12 November 1998 (1998-11-12) cited in the application page 40, line 25 - line 38	1,11

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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Date of the actual completion of the international search	Date of mailing of the international search report
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Name and mailing address of the ISA	Authorized officer
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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